

PATENT ABSTRACTS OF JAPAN

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(54) COMMUNICATION MACHINE CONFIGURATION HAVING LOW INTERMEDIATE FREQUENCY (LowIF) FUNCTION

(57)Abstract:

PROBLEM TO BE SOLVED: To overcome the problem wherein a transmission station generation oscillator and a reception station generation oscillator used for a transmitter require different oscillators by different oscillation frequencies in a communication apparatus using a Low IF system for a communication system in a communication apparatus having an OFDM modulation/demodulation function and each local oscillation oscillator needs to be shielded to reduce the interference noise of each oscillator to be generated.

SOLUTION: The configuration of transmission and reception local oscillators is shared by using a transmission signal that is modulated by a Low IF frequency in advance and using an image rejection configuration as the configuration of the modulator of a transmitter.

CLAIMS

[Claim(s)]

[Claim 1] Composition of a transmitter constituting a transmitter from an office and an oscillator from an office of a receiver mixer which are used for a modulator in composition of a transmitter which has an image rejection function using the same oscillator as a receiving mixer function using OFDM (Frequency Division Multiplexing) modulator and demodulator.

[Claim 2] Composition of a transmitter using a signal beforehand modulated with a low intermediate frequency (Low IF) in a modulating signal inputted into these

mixer circuits in mixer circuits used for a modulator of the 1st paragraph of an application-for-patent paragraph.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[The technical field belonging to an invention] In the composition of the transmitter of the time division multiplexing using the same low intermediate frequency this invention relates to the composition of the transmitter using the oscillating circuit same to the oscillator from an office of a transmitter-receiver.

[0002]

[Description of the Prior Art] Conventionally in the composition using the image rejection function as a receiver the frequency from a receiving station of the receiving mixer was set as the frequency of the difference of a low intermediate frequency (Low IF: f_c) and carrier reception frequency. On the other hand frequency conversion of the transmitted oscillating frequency used for the oscillator of a transmitter needed to be carried out using the oscillator by an intermediate frequency using a carrier frequency as it is. This intermediate frequency differs from this low intermediate frequency. For this reason the received local frequency of the receiver had to differ from the local frequency of the transmitter and it had to have two oscillators in the transmitter whose number is one. For this reason the number of parts of the transmitter increased and composition became complicated. The composition of the transmitter in a Prior art is shown in drawing 1. The received signal is amplified with the preamplifier 1-2 via the switch of 1-1. The output of an amplifier is divided into two channels a rectangular channel and a channel in phase and it restores to the signal of a rectangular channel by the mixer circuits 1-4. the oscillating frequency of the oscillator 1-9 from an office at this time -- a carrier frequency -- a part for a low intermediate frequency -- it oscillates on low frequency. Similarly it restores to a channel in phase via the mixer circuits 1-5 using the signal of the local dispatch frequency in phase which shifted the phase of the signal oscillated from the oscillator 1-9 from an office 90 degrees. The phase of the signal is shifted 90 degrees via the phase machine 1-6 and it compounds with the demodulation signal of a rectangular channel. An input signal is acquired for the compound signal via the band-pass filter 1-7 and the amplifier 1-8. On the other hand a sending signal is modulated by an inphase and the rectangular mixer circuits 1-11 and 1-12. The oscillating frequency of this transmitter from an office is equal to modulated carrier frequency and is oscillated with the oscillator 1-10 from a transmitting station. Here 1-13 shows a phase machine 90 degrees. The oscillation carrier frequency is the same as transmission carrier frequency. An inphase and a rectangular modulating signal are compounded and are inputted into the power amplifier 1-16 via the amplifier 1-14 and the bandpass filter 1-15. The amplified signal is transmitted as a transmit modulation

signal through the switch 1-1. In drawing 1 the transmitter showed the abnormal conditions by a direct conversion system and a receiver with the demodulator composition which used Low IF. For this reason the conventional transmitter differed in the local oscillating frequency of each transmitter from an office of a transmitter-receiver and needed to use two oscillators from an office. Among **** and a figure please understand what is only shown roughly to such an extent that the size of each block shape and the arrangement relationship can understand this invention. The imaged figure on the frequency axis of the modulating signal in a Prior art is shown in drawing 2. The spectral characteristics of the signal showed the spectrum of the OFDM signal. Here it explains using a direct conversion system. The output signal from baseband is outputted using a D/A converter. The frequency spectrum of the signal on the frequency axis of an output signal was shown in 2-1. The composition of the modulator uses direct conversion.

[0003]

[Problem(s) to be Solved by the Invention] In the composition of the transmitter which adopted the modulation method using the modulation method by a direct conversion system or an intermediate frequency and adopted the demodulation method using Low IF by the receiver in the transmitting side Since the oscillating frequency of the local oscillator used for the transmitter-receiver concerned differed two frequency oscillators from the office of a transmitter-receiver had to be used. For this reason problem ***** of having the oscillator in which oscillating frequency differed in two lines and the same transmitter and mutual oscillating frequency interfering each other. In order to avoid interference disturbance the mutual oscillator needed to be covered thoroughly. for this reason -- the shield part for carrying out full cover of the oscillator becomes large -- a mounting top -- ** -- big circuitry was needed and technical problems like circuitry becomes complicated occurred. The issue which it is going to solve in this invention is clarifying about the composition which does not produce interference between transmitter-receivers by using for a transmitter the oscillator from an office of the receiver which used the Low IF function and the same oscillator from an office.

[0004]

[Means for Solving the Problem] In this invention it becomes irregular by using the same Low IF frequency for a transmitter and a receiver by using an oscillator which has the same dispatch frequency from an office also as a transmitter-receiver. It enables them for the transmitting side and a receiver to be able to set up local oscillating frequency identically and to set a local frequency oscillator to one by applying a signal inputted into a mixer of a modulator by a baseband part applying abnormal conditions with Low IF frequency beforehand and making it a modulating signal. Drawing 3 shows composition of an image rejection mixer when local oscillating frequency of the transmitter 3-3 from an office is set as frequency which subtracted Low IF frequency from a carrier frequency. An input modulating signal uses a signal beforehand modulated by Low-IF frequency by baseband. This modulated input modulating signal is divided into an inphase and a quadrature component. A phase of one of the two's channel is shifted 90 degrees

with the phase machine 3-4 and the product of each signal is carried out by the mixer circuits 3-1 of an inphase and a rectangular channel and 3-2 on frequency of a difference of a carrier frequency and Low IF frequency. The frequency concerned is oscillated with an oscillator from an office of 3-3. Frequency oscillated with this oscillator from an office uses frequency which made only Low-IF frequency lower than actual transmission carrier frequency. Here 3-5 shows a 90-degree phase machine for making local dispatch frequency which intersected perpendicularly. Each mixer output is compounded using the composing device 3-6. A transmit modulation signal modulated by carrier frequency by this can be acquired. The characteristic on a frequency axis of a spectrum after an inputting [into a transmission mixer when Low IF is used for the transmitting side] baseband signal and a transmission mixer output was shown in drawing 4. Spectral characteristics showed an OFDM signal like drawing 2. Since a spectrum before a transmission mixer input has applied abnormal conditions with Low IF frequency by a baseband part center frequency of a spectrum serves as Low IF. An image component occurs by applying abnormal conditions again with a transmission mixer [modulating signal / from the baseband part] using local oscillating frequency. An image component can be oppressed by shifting a phase of one of the two's channel 90 degrees and compounding a mutual channel. In spectral characteristics after frequency conversion of drawing 4 the spectral characteristics of an image component showed a repressed situation by an arrow of an one-point dashed line. Therefore in drawing 4a a modulating signal centering on the carrier frequency f_c can be acquired. A spectrum when a Low IF method is used for the transmitting side is shown in drawing 5. Local oscillating frequency at the time of using a Low IF method is the frequency by Low IF frequency lower than a carrier frequency ($f_c - \text{Low IF}$). Frequency spectrum of an image is turned up focusing on frequency by Low IF frequency lower than this carrier frequency. Oppression of an image component can be performed by shifting a phase of one of the two's channel 90 degrees and compounding it. This suppression quantity was shown as an image rejection in a figure. In order to take a large value of image rejection it is necessary to make small dispersion in amplitude value of an inphase and a quadrature component and it is necessary to use a high-precision 90-degree phase machine. In a figure transmission power shows electric power per 100 kHz. Here total transmission power expresses comprehensive electric power of all the transmission bands. The magnitude of attenuation of a frequency ($f_c - \text{Low IF}$) ingredient by Low IF frequency lower than a carrier frequency serves as a carrier leak to total transmission power.

[0005]

[Embodiment of the Invention] This invention is applied to the high frequency circuit section and the transmitting baseband circuit unit of a transmitter-receiver of a wireless LAN communication apparatus which used the OFDM modulation machine. When the receiver of wireless LAN using the OFDM modulator and demodulator method of this invention receives using Low IF Low IF frequency is performed on the frequency of the half of an OFDM modulation zone. For

example when an OFDM frequency band is 20 MHz Low IF frequency is set as 10 MHz. If a carrier frequency sets to 5 GHz the dispatch frequency from an office will be set as 4.990 GHz. The signal which occurred in baseband and was modulated with the Low IF frequency of 10 MHz inputs the OFDM signal of the transmitting side into the modulation circuit of a high frequency circuit. An input signal is divided into a rectangular cross and an in-phase signal and after it shifts phase of one of the two 90 degrees quadrature modulation of it is carried out. Dispatch frequency is performed at the same 4.990 MHz as reception using the transmitter in which dispatch **** from an office of this modulator of the transmitter from an office of a receiver is the same. This composition can constitute a sending signal from the carrier frequency of 5GH.

[0006]

[Example] The block diagram of the transmitter of this invention and a receiver is shown in drawing 6. Unlike a direct conversion system a transmitter adopts a Low IF method as a modulation method. Operation of a receiver is the same as explanation of drawing 1. In the transmitting side the signal beforehand modulated on the same frequency as Low IF frequency is used for a sending signal. Abnormal conditions use the signal beforehand modulated by baseband. It becomes irregular to an inphase and rectangular channel signaling using the mixer circuits 6-10 and 6-11 using the frequency oscillated from the local oscillator 6-9 to the signal modulated by Low IF. Since an image component appears in the output of a transmission mixer it is necessary to remove an image component using an image rejection mixer in the mixer of the transmitting side as well as a receiver. For this reason the phase of one of the two's channel is shifted 90 degrees with the phase machine 6-14 and it inputs into each mixer. The compounded signal is transmitted through the switch 6-1 via the amplifier 6-15 the bandpass filter 6-16 and the power amplifier 6-17 as a transmit modulation signal. In this invention even if it constitutes the sending signal of a baseband signal as an inphase and a quadrature component beforehand the same composition is realizable. Among **** and a figure please understand what is only shown roughly to such an extent that the size of each block shape and the arrangement relationship can understand this invention. Although the transmitting baseband signal was divided into the in phase channel and rectangular cross channel with the phase machine 90 degrees and composition explained it in this example the composition using the signal which divided the baseband signal into the in phase channel and rectangular cross channel beforehand is also the range of this invention.

[0007]

[Effect of the Invention] In the composition of the conventional transmitter which used the quadrature modulation machine for the transmitter two oscillators from an office in which frequency differs had to be conventionally used for the transmitter-receiver using the receiver using a Low IF method. When the transmitting side by this invention also becomes irregular using the Low IF (low intermediate frequency) function which uses the same intermediate frequency as a receiver the transmitter from an office of transmission and reception can be

communalized the number of parts reduces and it becomes possible to simplify composition. It enables this to prevent the secondary harmonics from a voltage controlled oscillator (VCO: Voltage controlled oscillator) or amplifier from blocking a received input. With the conventional composition since two transmitters from an office which send thing oscillating frequency with high frequency were required of the transmitter-receiver it was required to prevent mutual frequency from interfering. It is not necessary to cover with one transmitter from an office in this invention by removing interference of a mutual signal from it being applicable to the transmitter from an office of a transmitter-receiver. In the former since two PLL of high frequency was required power consumption became large but it becomes possible to stop power consumption by using one line.

[0008]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] The lineblock diagram of the transmitter in a Prior art

[Drawing 2] The spectrum figure on the frequency axis of the modulating signal in a Prior art

[Drawing 3] The lineblock diagram of the transmitter in this invention

[Drawing 4] The spectral-characteristics figure of the abnormal-conditions function in an invention

[Drawing 5] The spectrum figure in a transmitting side mixer output

[Drawing 6] The example of this invention

[Description of Notations]

The explanations of letters or numerals used for each drawing are shown below.

Explanations of letters or numerals of drawing 1

A transmit/receive switch 1-2 : 1-1: An amplifier a 1 to 3: 90-degree phase machine 1-4 1-5 : A multiplier a 1 to 6: 90-degree phase machine a 1-7: bandpass filter 1-8: An amplifier the transmitter from a 1-9: receiving station the transmitter from a 1-10: transmitting station a 1-11 1-12: multiplier a 1 to 13: 90-degree phase machine a 1-14: amplifier a 1-15: bandpass filter 1-16 : amplifier

Explanations of letters or numerals of drawing 2

2-1: A baseband sending-signal spectrum 2-2 : abnormal-conditions sending-signal spectrum

Explanation of the sign of drawing 3

3-13-2: A multiplier the transmitter from a 3-3: transmitting station a 3 to 4: 90-degree phase machine a 3 to 5: 90-degree phase machine

Explanations of letters or numerals of drawing 6

Transmit/receive switch 6-2: amplifier and 6-3 6-4 : 6-1: A multiplier A 90-degree phase machine a 6 to 6: 90-degree phase machine 6-7 : 6-5: A bandpass filter 6-8: An amplifier the transmitter from a 6-9: transceiver office a 6-10 6-11: multiplier a 6 to 13: 90-degree phase machine a 6 to 14: 90-degree phase machine a 6-

15:amplifier 6-16:bandpass filter6-17 : amplifier
